

A NEW NEARCTIC SPECIES OF BITING MIDGE IN THE SUBGENUS
METAFORCIPOMYIA SAUNDERS OF *FORCIPOMYIA* MEIGEN
(DIPTERA: CERATOPOGONIDAE)

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Abstract.—The biting midge, *Forcipomyia (Metaforcipomyia) fehrerorum* Grogan and Sigrist, new species, is described and illustrated from specimens collected in Maryland and Florida and compared with its only Nearctic congener, *F. (M.) pluvialis* Malloch, which is redescribed and illustrated.

Key Words: Diptera, Ceratopogonidae, *Forcipomyia*, biting midge, new species, Maryland, Florida

The biting midges of the genus *Forcipomyia* Meigen are common inhabitants of wet and semi-moist habitats in all regions of the world except Antarctica. Currently, there are some 1,100 species in this extremely diverse genus in 36 subgenera (A. Borkent, personal communication). In their World Catalog of Biting Midges, Borkent and Wirth (1997) listed 13 species in the subgenus *Metaforcipomyia* Saunders, 11 of which are from the Old World, mainly Australia and Papua New Guinea. Their World Catalog included only two New World species, *F. (M.) pluvialis* Malloch, 1923, from the eastern United States and extreme southern Ontario, Canada (Wirth 1965) and *F. (M.) cerifera* Saunders, 1957, from Brazil.

After the publication of the World Catalog by Borkent and Wirth (1997), Marino and Spinelli (1999) recorded *F. cerifera* from Argentina and described two new species in the subgenus *Metaforcipomyia* from the northeastern portion of that country, *F. galliardi*, from

Misiones Province, and, *F. williamsi*, from Buenos Aires Province and Martin Garcia Island. Marino and Spinelli (2003) described three new species from Patagonian Argentina, provided a key to the New World species of *Metaforcipomyia* and reassigned *F. maculosa* Ingram and Macfie (1931) to *Metaforcipomyia* (included in the subgenus *Forcipomyia* by Borkent and Wirth 1997). Finally, Liu et al. (2001) described two new species of *Metaforcipomyia* from China, thereby raising the world total to 21 species (A. Borkent, personal communication). Spinelli and Borkent (personal communication) are currently studying a large series of *F. (Metaforcipomyia)* from Costa Rica in the collection at the Instituto Nacional de Biodiversidad, Santo Domingo de Heredia, Costa Rica (INBio) as well as Neotropical material from the National Museum of Natural History, Washington D. C. (USNM).

John R. Malloch collected the type series of *F. pluvialis* on 14 August 1921 during a collecting trip to Cabin John,

Montgomery Co., Maryland while trying to avoid a summer thunderstorm by seeking shelter under a beech tree. On the trunk of this tree he noticed "a few dry spots and my attention was attracted to some minute white dots on these areas. A close scrutiny disclosed that they were small ceratopogonine flies and a series was bottled for a more detailed inspection later. This inspection disclosed the fact that the species is undescribed and one of the most strikingly colored occurring in this country. It is so very small that it was not at any time seen in the net nor elsewhere during the summer though I collected at the same spot frequently." (Malloch 1923). Malloch's original description of both sexes of this species is very brief and contains mainly notations of its coloration, but, no illustrations of any anatomical features of this beautiful elfin midge. Bill Wirth (1951) provided details of females and an illustration of the male genitalia, as well as new records of this species from Louisiana, Virginia, and Panama.

Herein, we describe and provide detailed illustrations of a second species in the subgenus *Metaforcipomyia* from North America that is radically different in coloration, body form and anatomical details from its relative, *F. pluvialis*. We also provide redescriptions and illustrations of both sexes of *F. pluvialis*. For general terms of structures of Ceratopogonidae, see Downes and Wirth (1981); for characters distinguishing members of the subgenus *Metaforcipomyia* from other subgenera of *Forcipomyia*, see Saunders (1957) and Debenham (1987). Terms for general structures including genitalia and wing venation are those in the Manual of Nearctic Diptera by McAlpine (1981) except for recent modifications of wing veins and cells as proposed by Szadziewski (1996) which were summarized in a table by Spinelli and Borkent (2004). Numerical data are

presented as mean, range, followed by sample size.

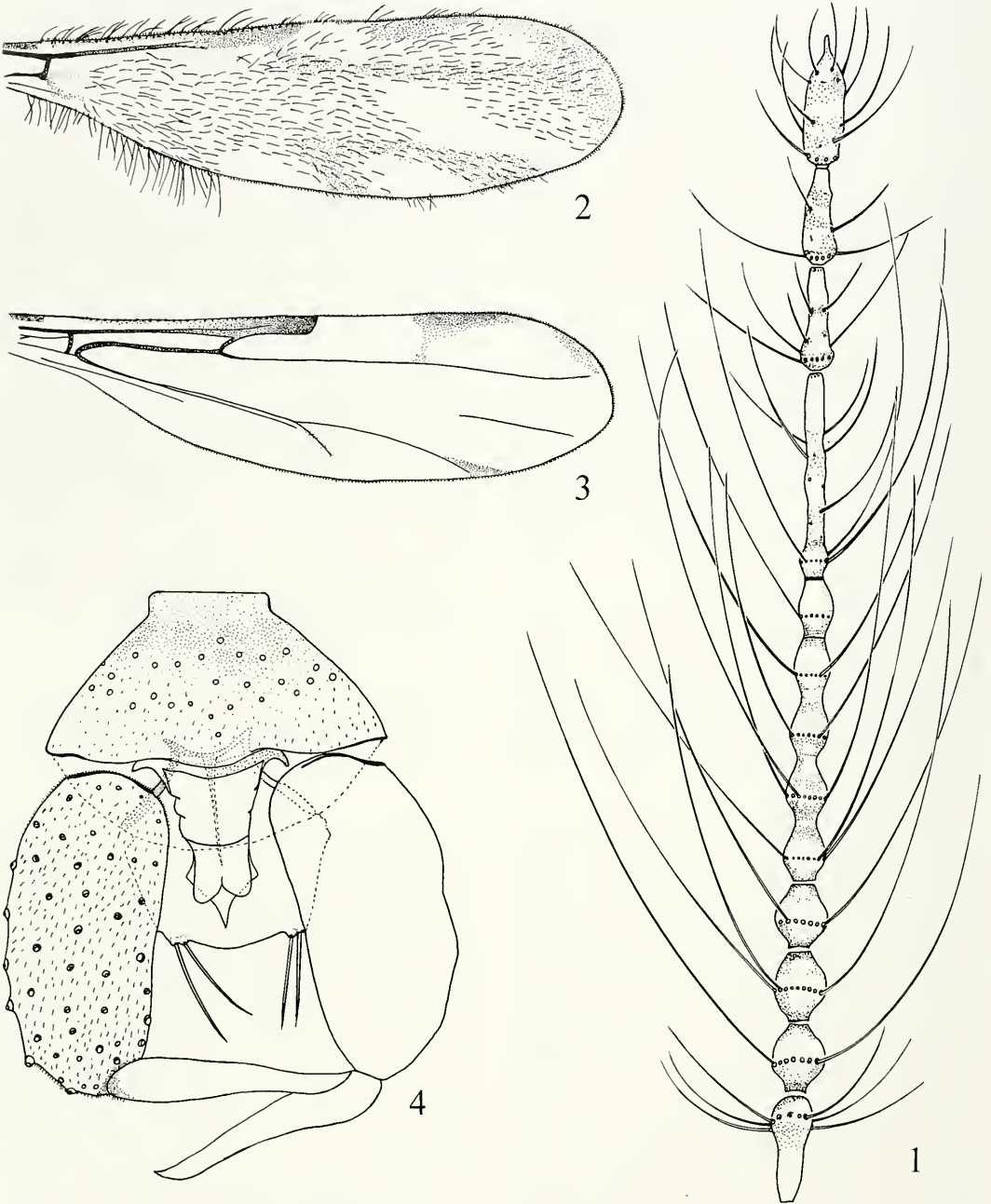
All specimens examined are mounted onto microscope slides in phenol-balsam by the methods described by Wirth and Marston (1968). Measurements and other data are presented as mean, minimum-maximum values, followed by sample size. The holotype, allotype, and most paratypes of our new species are deposited in the USNM. Other paratypes are deposited in the Academy of Natural Sciences, Philadelphia; Canadian National Collection, Ottawa; Florida State Collection of Arthropods, Gainesville; Museo de La Plata, Argentina; Collection of Arthropods with Medical Importance of the Instituto Nacional de Diagnostico y Referencia Epidemiologicos, Mexico City; and Instituto Nacional de Biodiversidad, Santo Domingo de Heredia, Costa Rica.

***Forcipomyia (Metaforcipomyia)*
fehrerorum Grogan and Sigrist,
new species**

(Figs. 1–10)

Diagnosis.—Distinguished from its only Nearctic relative, *F. (M.) pluvialis*, by its black to dark brown coloration; male parameres with medioposterior rod like extension and aedeagus arrowhead-shaped with broad, triangular, pointed tip; female with unequal-sized spermathecae with short, stout necks.

Male.—**Head:** Dark brown. Vertex, clypeus, palpus, flagellomeres with large, coarse setae with minute spicules on distal portions. Eyes contiguous, bare. Antennal flagellum (Fig. 1) light brown; flagellomeres 1–12 more or less vasiform, flagellomere 13 broader with narrow tip; flagellomeres 1–4 or 1–5 separate, 5–8 or 6–9 fused, 10–13 always separate; all flagellomeres with subbasal ring of sensilla chaetica, those on flagellomeres 2–10 very long, forming the dense plume, flagellomeres 10–13 with additional scat-



Figs. 1-4. *Forcipomyia (Metaforcipomyia) fehrerorum*, male. 1, Antennal flagellum. 2, Wing, macrotrichia intact. 3, Wing, macrotrichia removed. 4, Genitalia.

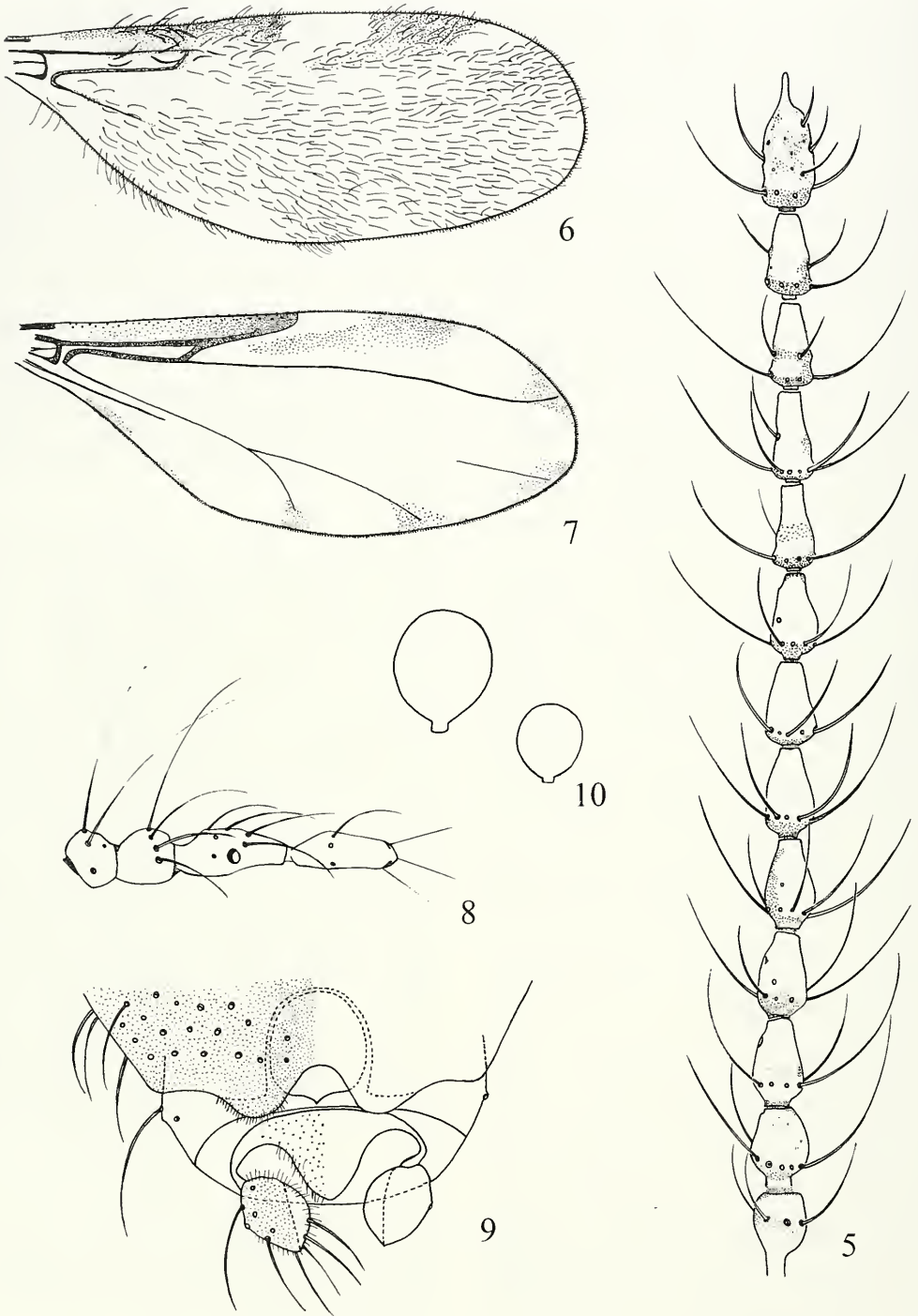
tered sensilla chaetica and sensilla basiconica; antennal ratio 0.42 (0.35-0.46, $n=26$). Palpus brown, 4-segmented (segment 4 = fused segments 4+5); apex of segment 4 with apical smaller, non-

spiculate setae; segment 3 moderately slender with single small pit and smaller opening, rarely with 2 small pits (as on right palpus of holotype); palpal ratio 2.52 (2.00-2.86, $n=33$). Mandible vesti-

gial, without teeth. *Thorax*: Dark brown; with dense large, coarse setae bearing minute spicules. Scutum with 4 moderately defined rows of large setae, additional scattered large and smaller setae; scutellum with 8 more or less centrally located large setae. Legs dark brown except for tarsomeres 3–5 which are pale; tarsi with shorter, broader, flattened setae with central striations; hind tibial comb similar to *F. pluvialis* (Fig. 18); claws small, equal-sized, curved and bent 90° at mid-length, tips slender, apices sharply pointed, entire or barely bifid. Wing (Figs. 2–3) membrane hyaline, covered with microtrichia and dense, coarse macrotrichia bearing minute spicules, those on costa, radius, broader, flattened with medial striations; distribution of macrotrichia generally densest on major veins, with pattern of pale spots due to absence of macrotrichia (Fig. 2); venation and pigmentation as illustrated (Fig. 3) from a wing devoid of macrotrichia; radial cells obliterated; vein M_1 curving upward on extreme distal portion, apex not reaching wing margin, M_2 obsolete on proximal $2/3$, distal $1/3$ not reaching wing margin; vein CuA_1 and CuA_2 forking at level just beyond fusion of costa and radius, CuA_2 obsolete on distal $1/3$; anal lobe very poorly developed; wing length 0.89 (0.81–0.97, $n=29$) mm, breadth 0.28 (0.22–0.30, $n=29$) mm; costal ratio 0.43 (0.41–0.45, $n=29$). Halter pale; knob pale to white. *Abdomen*: Slender, dark brown, intersegmental areas, pleurae yellowish to grayish; surface with dense large, coarse setae bearing minute spicules. Genitalia as in Fig. 4. Sternite 9 broader than long, with smaller, finer setae, posterior margin nearly straight; tergite 9 tapering abruptly distally on proximal $1/3$, distal $2/3$ nearly parallel sided, with pair of large setae on extreme distolateral margins, cercus poorly developed, flattened, covered with fine setae. Gonocoxite twice as long as broad, nearly straight, covered

with long coarse and fine setae as on sternite 9; gonostylus pale in color except for extreme base, nearly straight, tapering slightly distally, apex barely curved, tip sharply pointed. Aedeagus longer than broad; extreme proximal portion heavily sclerotized, basal arm recurved 60° , tip pointed; distal portion lightly sclerotized, hyaline, with few marginal wrinkles, apex broad, bifid with an underlying triangular, arrowhead-shaped, sharply pointed tip. Parameres fused, heavily sclerotized; basal apodemes curved distally, fused into a posteriorly curved median bridge bearing a slender elongate, medioposterior rodlike extension.

Female.—Similar to male with the following notable sexual differences. *Head*: Antennal flagellum (Fig. 5) with flagellomere 13 distinctly longer than proximal 12, terminal papilla more basally constricted; flagellomeres with basal whorl of shorter sensilla chaetica; flagellomeres 8–13 with additional, scattered, shorter sensilla chaetica; antennal ratio 0.75 (0.63–0.88, $n=35$). Palpus (Fig. 8) similar to male; segment 3 broader than male, with single small pit, rarely with two smaller pits; palpal ratio 2.00 (1.89–2.38, $n=40$). *Thorax*: Legs similar to male but tarsomeres 2–5 pale; claws more rounded, tips entire. Wing (Figs. 6–7) similar to male but broader; with pattern of pale spots due to absence of macrotrichia as illustrated (Fig. 6); venation, pigmentation as illustrated (Fig. 7) from a wing devoid of macrotrichia; wing length 0.80 (0.73–0.92, $n=36$) mm, breadth 0.33 (0.31–0.40, $n=36$) mm; costal ratio 0.43 (0.39–0.47, $n=36$). *Abdomen*: Stout, broader with narrower pale pleurae, intersegmental areas. Genitalia as in Fig. 9. Posterior margin of sternite 8 with slender, circular, sclerotized marking with thicker basal arms; sternite 9 very short medially; sternite 10 with fine setae only. Spermathecae (Fig. 10) subspherical,



Figs. 5-10. *Forcipomyia* (*Metaforcipomyia*) *fehreorum*, female. 5, Antennal flagellum. 6, Wing, macrotrichia intact. 7, Wing, macrotrichia removed. 8, Palpus. 9, Genitalia. 10, Spermathecae.

heavily sclerotized, unequal-sized with short, broad necks; one aberrant paratype with only a single small spermatheca.

Type material.—Holotype ♂, allotype ♀, 9 ♂ and 13 ♀ paratypes labeled: MD, Wicomico Co., Wango, pitcher plant bog on TNC prop S junct. of Fooks Rd & Twilleys Bridge Rd., 14-21-VI-2004, W.L. Grogan, Malaise trap. Other paratypes: 1 ♂, same data except 4-11-V-2004; 2 ♀, same data except 11-17-V-2004; 4 ♀, same data except 17-24-V-2004; 1 ♂, same data except 7-14-VI-2004; 1 ♂, 6 ♀, same data except 21-28-VI-2004; 2 ♂, 3 ♀, same data except 28-V/5-VII-2004; 4 ♂, 7 ♀, 19-26-VII-2004; 2 ♂, 2 ♀, same data except 26-VII/2-VIII-2004; 3 ♂, 3 ♀, same data except 2-9-VIII-2004; 5 ♂, 4 ♀ same data except 26-VIII-2004. MD, Wicomico Co., Salisbury, 17-23-VIII-1982, Wm. L. Grogan, Jr., Malaise trap, 1 ♀; 1 ♂, same data except 3-10-VIII-1992; 2 ♀, same data except 29-VI-6-VII-1993. MD, Wicomico Co., Wango, Nassawango Creek at Waste Gate Rd., 1-7-V-2006, Wm. L. Grogan, Jr., Malaise trap, 1 ♂; 2 ♂, 1 ♀, same data except 22-29-V-2006; 3 ♀, same data except 27-VI/4-VII-2006; 2 ♀, same data except 4-11-VII-2006; 1 ♀, same data except 11-18-VII-2006; 1 ♀, same data except 18-25-VII-2006; 2 ♀, same data except 1-7-VIII-2006; 2 ♀, same data except 8-15-VIII-2006; 3 ♂, 2 ♀, same data except 15-22-VIII-2006; 1 ♂, same data except 22-29-VIII-2006; 3 ♀, same data except 29-VIII/7-IX-2006. FL, Highlands Co., Sebring, Highlands Hammock St. Park, 15-IV-1970, W. W. Wirth, light trap, 1 ♀; Wakulla Co., Wakulla Springs St. Pk., 25-26-V-2004, S. Murphree, CDC LT, swamp on Lodge Rd., 1 ♂, 2 ♀.

Distribution.—Known only from Florida and Maryland, but this species probably occurs throughout the southeastern Atlantic Coastal Plain.

Etymology.—We are pleased to name this new species in honor of the Joseph

Fehrer, Sr. (deceased) family, including his wife Ilia and their children Joe, Jr. and Melissa, in recognition of their family's long dedicated efforts to preserving the floodplain of Nassawango Creek in both Wicomico and Worcester counties, Maryland.

Discussion.—This new species is most similar to *F. (M.) cerifera* from Brazil and extreme northeastern Argentina in coloration and morphologically. This Neotropical species differs from the new Nearctic species by its wing with a narrow 1st radial cell and lacking vein M_2 (Marino and Spinelli 1999). The male genitalia of *F. cerifera* are very similar to those of *F. fehreorum*, but its aedeagus has a much deeper basal arch and lacks an apical point, the parameres have a straight, non-convex base, and the distomedial extension reaches the tip of the aedeagus. Females of *F. cerifera* differ from our new species in having subequal sized spermathecae with narrow necks and the genital sclerotization is more ovoid in shape with a posteromedial extension.

Despite collecting by WLG with Malaise and light traps since 1979 in the environs of Salisbury, MD, only a few individuals of this species were obtained during 1982 and 1993. However, the large series collected during 2004 and 2006 indicates that this strikingly different relative of the more common and apparently more widespread *F. pluvialis*, can also be common in certain, optimal microhabitats. All specimens collected during 2004 were from the margin of a purple pitcher plant (*Sarracenia purpurea* L.) bog in an open power-line cut that is fed by a small tributary of Nassawango Creek. This bog also contains small Red maple (*Acer rubrum* L.), Buttonbush (*Cephalanthus occidentalis* L.), cattails (*Typha* sp.) and sedges. Conversely, all specimens collected during 2006 came from the flooded, swampy headwaters of Nassawango Creek that is

several kilometers upstream and quite different from the 2004 collection site. This latter site is dominated by Baldcypress (*Taxodium distichum* (L.) Richard.), Red maple, Buttonbush, Greenbrier (*Smilax* sp.), Nettle (*Urtica* sp.) and Jewelweed (*Impatiens capensis* Meerb.).

The discovery of this new species in the subgenus *Metaforcipomyia* of *Forcipomyia* in the southeastern United States was unexpected. Well known as a well-traveled, tireless collector, Willis Wirth apparently only collected and/or slide mounted a single specimen of this species from FL, which we discovered during our examination of some 800 slide-mounted specimens of unidentified *Forcipomyia* in the USNM collection. We predict that future collections will yield further specimens of this new species from other states in the southeastern Atlantic and possibly Gulf Coastal plains.

Forcipomyia (*Metaforcipomyia*) *pluvialis*
Malloch
(Figs. 11–21)

Forcipomyia pluvialis Malloch 1923: 4 (♂, ♀; Maryland).

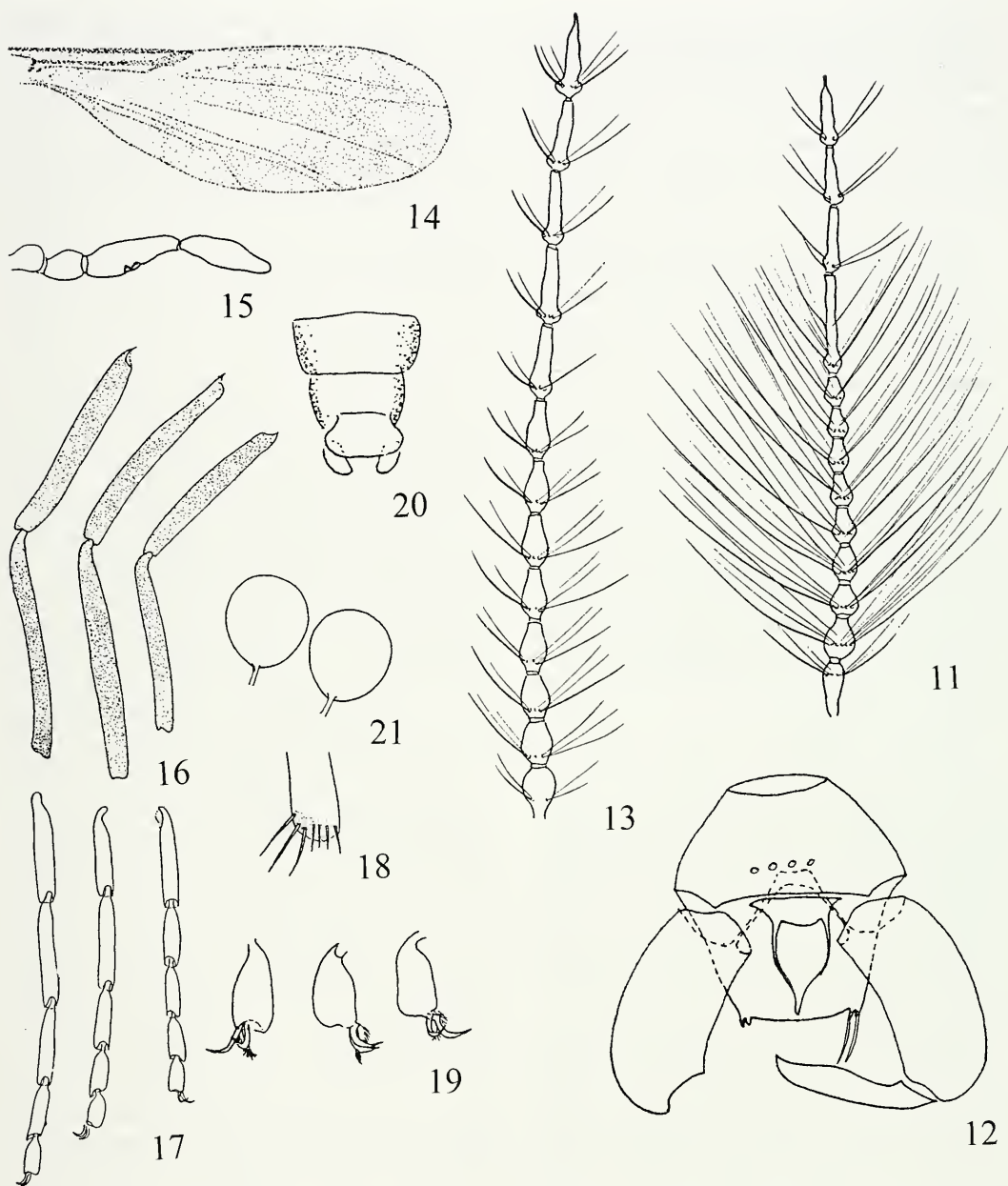
Forcipomyia (*Forcipomyia*) *pluvialis*: Johannsen 1943: 778 (in list of North American species); Wirth 1951: 314 (♀; description; fig. ♂ genitalia; Virginia, Louisiana, Panama).

Forcipomyia (*Metaforcipomyia*) *pluvialis*: Wirth 1965: 125 (in North American catalog; distribution); Borkent and Wirth 1997: 42 (in world catalog).

Diagnosis.—Distinguished from its only Nearctic relative, *F. (M.) fehrerorum*, by its whitish or yellowish coloration; male with mediobasal bar of parameres curved anteriorly, straight posteriorly, without posterior or anterior extensions and proximal half of aedeagus shield-shaped, distal portion elongate, slender, tapering to a narrow pointed tip; female with broad, heavily sclero-

tized sternite 8 and spherical, equal-sized spermathecae with long, slender necks.

Male.—*Head*: Brown on vertex, golden brown on frons, clypeus, palpus grayish brown. Vertex, clypeus, palpus, antennal pedicel, flagellomere 1 with coarse setae, distal portions spiculate. Eyes bare, broadly contiguous. Antennal pedicel dark brown; flagellum (Fig. 11) with proximal 10 flagellomeres golden, distal 3 grayish brown; flagellomeres 1–9 more or less vasiform, 10–13 more elongate; all flagellomeres with sub-basal whorl of sensilla chaetica, those on flagellomeres 2–10 longer, forming dense, golden plume, 10–13 with scattered shorter sensilla chaetica and sensilla basiconica; flagellomeres 1, 2, 11–13 separate, 2–4, 9–10 semi-fused, 5–8 fused; antennal ratio 0.46 (0.41–0.54, n=10). Palpus light brown, 4-segmented; segment 3 moderately slender with 1–3 small, shallow, round sensory pits bearing large capitate sensilla with most of their lengths extending outside pit; segment 4 (fused 4+5) with apical setae; palpal ratio 3.04 (2.63–3.43, n=10). Mandible slender, reduced, without teeth. *Thorax*: Golden yellow; anterior margin of scutum, scutellum, postscutellum, ventral sclerites brown. Legs covered with dense, coarse, flattened, spiculate setae; femora, tibiae light brown, tarsi pale brown; hind tibial comb similar to female (Fig. 18); claws small, gently curved, bent 90° at midlength, tips narrow, pointed with apices very sharp, apparently entire. Wing similar to female (Fig. 14) but more narrow; membrane pale transparent with fine microtrichia and much larger, coarse, spiculate, flattened macrotrichia that are dense over radial sector, which appears as a “stigma”; both radial cells obliterated; cell r₃ with weak intercalary vein, upper fork much shorter than lower fork; vein M₁ nearly complete to wing margin, M₂ obsolete; CuA₁, CuA₂ forking at level beyond end of costa; anal lobe very



Figs. 11–21. *Forcipomyia (Metaforcipomyia) pluvialis*. 11–12, Male 13–21, Female. 11, 13, Antennal flagella. 12, Genitalia. 14, Wing, macrotrichia removed. 15, Palpus. 16, Femora and tibiae, from right to left, fore, mid, hind. 17, Tarsi, from right to left, fore, mid, hind. 18, Hind tibial comb. 19, 5th tarsomeres and claws, from right to left, fore, mid, hind. 20, Terminal abdominal segments, ventral view. 21, Spermathecae.

poorly developed; wing length 0.85 (0.78–0.92, $n=10$) mm; breadth 0.25 (0.21–0.28, $n=9$) mm; costal ratio 0.39 (0.36–0.45, $n=10$). Halter light brown.

Abdomen: Golden to light brown; posterior margins of sternites, tergites brown; surface with long, slender setae which are apparently non-spiculate. Genitalia as in

Fig. 12; brown, except gonostyli pale. Sternite 9 broadening distally from base, conical, posterior margin straight, 2–6 large setae in more or less single row near level of base of parameres; tergite 9 tapering gradually distally to more or less truncate distal margin, distolateral margins with 2 or more large setae. Gonocoxite slightly curved, twice as long as broad; gonostylus curving slightly distally, tapering distally from mid-portion to hooked, sharply pointed tip. Aedeagus with slightly curved basal arms; basal arch very shallow; proximal half shield-shaped, well sclerotized on margin and basal arm; distal half lightly sclerotized, tapering abruptly to narrow pointed tip that extends to or beyond posterior margin of tergite 9. Parameres fused, moderately sclerotized; basal portion a narrow bridge that is slightly curved on anterior margin; distal arm slender, straight, connecting to dorsal base of gonocoxite.

Female.—Similar to male with the following notable sexual differences. *Head*: Golden brown. Antennal flagellum (Fig. 13) brown, with all flagellomeres more or less vasiform, 9–13 longer than 1–8, 13 with tapering, terminal papilla; bases with shorter, less dense whorl of sensilla chaetica; antennal ratio 0.90 (0.83–0.94, $n=10$). Palpus (Fig. 15) brown; segment 4 (fused 4+5) moderately broad at mid-portion, tapering slightly distally to rounded tip; papal ratio 3.38 (2.50–3.86, $n=9$). *Thorax*: Golden, anterior portion of scutum, scutellum, post-scutellum, fore coxa brown. Legs (Figs. 16, 17) with large setae densest on tibiae, tarsi; hind tibial comb (Fig. 18) with 3 large lateral setae and 4 smaller apical setae; 5th tarsomeres light brown, claws (Fig. 19) more rounded, tips entire. Wing (Fig. 14) slightly broader than male; veins very pale, often not discernable; anal lobe slightly better developed than in male; wing length 0.81 (0.66–0.94, $n=10$) mm, breadth 0.28

(0.23–0.34, $n=10$) mm; costal ratio 0.36 (0.33–0.39, $n=10$). *Abdomen*: Golden to light brown, lateral edges of sternites, tergites brown (Fig. 20); sternite 8 enlarged, broadest on distal half, shield-shaped; sternite 9 with small, poorly sclerotized circular marking on distal margin; sternite 10 with fine setae and subapical apical pair of larger setae. Spermathecae (Fig. 21) lightly sclerotized, globular, equal-sized with long, narrow necks.

Distribution.—Extreme southeastern Canada and the United States east of the Mississippi River, south to Central America and northern Brazil.

Specimens examined.—FLORIDA: Alachua Co., Gainesville, Chantilly Acres, VI-1967, F. S. Blanton, light trap, 1 ♀, same data except 16-VII-1967, F. S. Blanton, 1 ♂, same data except 25-VIII-1967, 1 ♂, same data except Oak Crest, 27-X-1986, W. W. Wirth, UVLT, 1 ♂, 1 ♀; Indian River Co., Vero Beach, Ent. Res. Cntr., light trap, Mar. 1958, 1 ♂, same data except III-1960, 1 ♂, same data except, April 1960, 1 ♂; Levy Co., Yankeetown, X-1981, Alan Wilkening, light trap with CO₂, 1 ♂, 7 ♀; Monroe Co., Big Pine Key, 3 June 1971, D. G. Young, B. L. Trap, 1 ♂, Middle Torch Key, 13 Feb. 1978, W. W. Wirth, light trap, 3 ♂, 1 ♀. LOUISIANA: Baton Rouge Parish, Baton Rouge, Audubon Hall, May 1947, W. Wirth, LT, 1 ♀. MARYLAND: Montgomery Co., Glen Echo, 14-VIII-1921, J. R. Malloch, ♂ genitalia (paratype); Prince Georges Co., Patuxent Wildlife Refuge, 16-VII-1978, W. W. Wirth, Malaise trap, 1 ♀; Wicomico Co., Salisbury, 23–31 May 1979, Wm. L. Grogan, Jr., Malaise trap, 1 ♂, 2 ♀, same data except 21-28-VII-1993, 1 ♀, same data except 8-14-VIII-2003, 1 ♂, 1 ♀, same data except 24-31-VIII-2003, 1 ♀, Wango, pitcher plant bog on TNC Prop. S junct. of Fooks Rd. & Twilleys Bridge Rd., 11-17-V-2004, W. L. Grogan, Malaise trap, 2 ♂,

same data except 17-24-V-2004, 1 ♂, same data except 24-31-V-2004, 2 ♂, 1 ♀, same data except 28-VI/5-VII-2004, 1 ♂, same data except 5-12-VII-2004, 1 ♂, same data except 12-19-VII-2004, 1 ♀, same data except 26-VII/2-VIII-2004, 1 ♀, same data except 2-9-VIII-2004, 1 ♀, same data except 16-23-VIII-2004, 3 ♂, 2 ♀, Wango, Nassawango Creek at Waste Gate Rd., 22-29-V-2006, Wm. L. Grogan, Jr., Malaise trap, 1 ♀, same data except 20-27-VI-2006, 1 ♂, 1 ♀, same data except 27-VI/4-VII-2006, 1 ♂, 2 ♀, same data except 4-11-VII-2006, 1 ♂, same data except 25-31-VII-2006, 1 ♀, same data except 8-15-VIII-2006, 1 ♂, same data except 22-29-VIII-2006, 1 ♂; Worcester Co., Snow Hill, 30-VI-1968, W. H. Anderson, light trap, 2 ♂. MASSACHUSETTS: Middlesex Co., Concord, 27 July 1961, W. W. Wirth, marshy pond, 5 ♂. NORTH CAROLINA: Highlands Co., July 1965, P. M. Marsh, Malaise trap, 1 ♂, 2 ♀; Transylvania Co., Lake Toxaway, 9-20-VII-1989, W. W. Wirth, UVlt, 1 ♂. VIRGINIA: Warren Co., Howellsville, 4 July 1974, P. G. Bystrak, at yellow light, oak woods, 1 ♂; Fairfax Co., Falls Church, 29 July 1950, W. W. Wirth, 5 ♂, same data except 6-VIII-1950, 1 ♂, 1 ♀, same data except Holmes Run, 17-VII-1958, 1 ♂, 1 ♀, same data except 10 Aug. 1958, 6 ♂, same data except 15-VI-1960, 1 ♂, same data except 17-VI-1960, 6 ♂, same data except 26 June 1960, 1 ♂, same data except 14 Sept. 1960, 1 ♂, same data except 17 Oct. 1960, 1 ♂, 1 ♀, same data except 17-VI-1960, 1 ♂, 3 ♀, same data except 19 Oct. 1960, 1 ♂, same data except 5 Sept. 1961, 1 ♀, same data except 10 Oct. 1961, 1 ♂. WEST VIRGINIA: Hardy Co., Lost River St. Pk., 8-14 July 1963, K. V. Krombein, tent trap, 7 ♂, 2 ♀. ONTARIO: Kemptville, 5 June 1960, W. Wirth, 1 ♂.

Discussion.—The original description by Malloch (1923) was brief and dealt mainly with coloration and some exter-

nal characteristics of both sexes. Wirth (1951) briefly characterized the female hind tarsal ratio, antennal flagellomeres, and spermathecae, which he noted as "...the ducts not sclerotized." However, our examination of some 50 slide-mounted specimens revealed that the spermathecal necks are long, slender and lightly sclerotized (Fig. 21).

The male genitalia were illustrated by Wirth (1951), but not described. His illustration (Wirth 1951: Fig. 2) is fairly accurate except for the aedeagus, which he depicts as shorter, shield-shaped with a rounded apex that has a shallow median notch. Our examination of some 70 slide mounted specimens revealed that the aedeagus is indeed shield-shaped, but only on its proximal half. The extremely hyaline, narrow, and sharply pointed distal portion of the aedeagus (Fig. 12) is often difficult to discern unless this structure is viewed with high contrast at 100-400×.

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trations of *F. pluvialis* that we have slightly modified in a few cases. Finally, we extend special thanks to Art Borkent and an anonymous individual for reviewing an earlier draft of the manuscript.

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